Claims

1. Substantially pure DNA encoding an *Rps* polypeptide.

2. The DNA of claim 1, wherein said DNA contains the *RPS2* gene.

3. The DNA of claim 1, wherein said DNA is genomic DNA.

4. The DNA of claim 1, wherein said DNA is cDNA.

5. The DNA of claim 1, wherein said DNA is of a plant of the genus *Arabidopsis*.

6. Substantially pure DNA having the sequence of Fig. 2, or degenerate variants thereof, and encoding the amino acid sequence of open reading frame "a" of Fig. 2.

7. Substantially pure DNA having about 50% or greater sequence identity to the DNA sequence of Fig. 2.

8. The DNA of claim 1 or 2, wherein said DNA is operably linked to regulatory sequences for expression of said polypeptide; and

wherein said regulatory sequences comprise a promoter.

9. The DNA of claim 8, wherein said promoter is a constitutive promoter.

10. The DNA of claim 8, wherein said promoter is inducible by one or more external agents.

11. The DNA of claim 8, wherein said promoter is cell-type specific.

12. A cell which contains the DNA of claim 1.

13. The cell of claim 12, said cell being a plant cell.

14. The plant cell of claim 13, said plant cell being resistant to disease caused by a plant pathogen carrying an avirulence gene generating a signal recognized by an Rps polypeptide.

15. The plant cell of claim 14, said plant pathogen carrying an *avrRpt2* gene.

16. The plant cell of claim 14, said plant cell being from the group of plants comprising *Arabidopsis*, tomato, soybean, bean, maize, wheat, and rice.

17. The plant cell of claim 14, said plant pathogen being *Pseudomonas syringae*.

18. The plant cell of claim 13, wherein said plant cell further contains an *avrRpt2* gene operably linked to regulatory sequences; and

wherein said regulatory sequences comprise a promoter.

19. The plant cell of claim 18, wherein said promoter is a constitutive promoter.

20. The plant cell of claim 18, wherein said promoter is inducible by one or more external agents.

21. The plant cell of claim 18, wherein said promoter is cell-type specific.

22. A transgenic plant which contains the DNA of claim 1 integrated into the genome of said plant, wherein said DNA is expressed in said transgenic plant.

23. A transgenic plant which contains the DNA of claim 8 integrated into the genome of said plant, wherein said DNA is expressed in said transgenic plant.

24. A transgenic plant generated from the plant cell of claim 18 wherein said DNA and said *avrRpt2* gene are expressed in said transgenic plant.

25. A seed from a transgenic plant of claim 22.

26. A seed from a transgenic plant of claim 23.

27. A seed from a transgenic plant of claim 24.

28. A cell from a transgenic plant of claim 22.

29. A cell from a transgenic plant of claim 23.

30. A method of providing resistance to a plant pathogen in a plant, said method comprising:

producing a transgenic plant cell comprising the DNA of claim 1 integrated into the genome of said transgenic plant cell and positioned for expression in said plant cell; and

growing a transgenic plant from said plant cell wherein said DNA is expressed in said transgenic plant.

31. A method of detecting a resistance gene in a plant cell, said method comprising:

contacting the DNA of claim 1 or a portion thereof greater than about 18 nucleic acids in length with a preparation of genomic DNA from said plant cell under hybridization conditions providing detection of DNA sequences having about 50% or greater sequence identity to the sequence of Fig.2.

32. A method of producing an Rps2 polypeptide comprising:

providing a cell transformed with DNA encoding an Rps2 polypeptide positioned for expression in said cell; culturing said transformed cell under conditions for expressing said DNA; and

isolating said Rps2 polypeptide.

33. A method of providing, in a transgenic plant, resistance to a plant pathogen, said method comprising:

producing a transgenic plant cell comprising the DNA of claim 8 integrated into the genome of said transgenic plant cell and positioned for expression in said plant cell; and

growing said transgenic plant from said plant cell wherein said DNA is expressed in said transgenic plant.

34. A method of providing, in a transgenic plant, resistance to a plant pathogen, said method comprising:

growing said transgenic plant from the plant cell of claim 18 wherein said DNA and said *avrRpt2* gene are expressed in said transgenic plant.

35. A method of isolating a disease resistance gene or portion thereof in plants having sequence identity to *RPS2*, said method comprising:

amplifying by PCR said disease resistance gene or portion thereof using oligonucleotide primers wherein said primers

(a) are each greater than 13 nucleotides in length;

(b) each have regions of complementarily to opposite DNA strands in a region of the nucleotide sequence of Fig. 2; and

(c) optionally contain sequences capable of producing restriction enzyme cut sites in the amplified product; and

isolating said disease resistance gene or portion thereof.

36. A substantially pure Rps2 polypeptide.

37. The polypeptide of claim 32, comprising an amino acid sequence substantially identical to an amino acid sequence shown in Fig. 2.

38. A vector comprising the DNA of claim 1, said vector being capable of directing expression of the peptide encoded by said DNA in a vector-containing cell.

39. A vector comprising the DNA of the *avrRpt2* gene operably linked to regulatory sequences wherein said regulatory sequences comprise a promoter.

40. A vector comprising the DNA of claim 1 and the DNA of the *avrRpt2* gene operably linked to regulatory sequences wherein said regulatory sequences comprise a promoter.

41. A substantially pure oligonucleotide comprising the sequence:

5′ GGNATGGGNGGNNTNGGNAARACNAC 3′, wherein N is A, T, G, or C; and R is A or G.

42. A substantially pure oligonucleotide comprising the sequence:

5′ NARNGGNARNCC 3′, wherein N is A, T, G or C; and R is A or G.

43. A substantially pure oligonucleotide comprising the sequence:

5′NCGNGWNGTNAKDAWNCGNGA 3′, wherein N is A, T, G or C; W is A or T; D is A, G, or T; and K is G or T.

44. A substantially pure oligonucleotide comprising the sequence:

5′ GGWNTBGGWAARACHAC 3′, wherein N is A, T, G or C; R is G or A; B is C, G, or T; H is A, C, or T; and W is A or T.

45. A substantially pure oligonucleotide comprising the sequence:

5′ TYGAYGAYRTBKRBRA 3′, wherein R is G or A; B is C, G, or T; D is A, G, or T; Y is T or C; and K is G or T.

46. A substantially pure oligonucleotide comprising the sequence:

5′ TYCCAVAYRTCRTCNA 3′, wherein N is A, T, G or C; R is G or A; V is G or C or A; and Y is T or C.

47. A substantially pure oligonucleotide comprising the sequence:

5′ GGWYTBCCWYTBGCHYT 3′, wherein B is C, G, or T; H is A, C, or T; W is A or T; and Y is T or C.

48. A substantially pure oligonucleotide comprising the sequence:

5′ ARDGCVARWGGVARNCC 3′, wherein N is A, T, G or C; R is G or A; W is A or T; D is A, G, or T; and V is G, C, or A.

49. A substantially pure oligonucleotide comprising the sequence:

5′ ARRTTRTCRTADSWRAWYTT 3′, wherein R is G or A; W is A or T; D is A, G, or T; S is G or C; and Y is C or T.

50. A recombinant plant gene comprising the DNA sequence:

5′ GGNATGGGNGGNNTNGGNAARACNAC 3′, wherein N is A, T, G or C; and R is A or G.

51. The gene of claim 50, further comprising the sequence:

5′ NARNGGNARNCC 3′, wherein N is A, T, G or C; and R is A or G.

52. The gene of claim 51, further comprising the sequence:

5′ NCGNGWNGTNAKDAWNCGNGA 3′, wherein N is A, T, G or C; W is A or T; D is A, G or T; and K is G or T.

53. A recombinant plant gene comprising a combination of any two or more sequences of claims 50, 51, and 52.

54. A substantially pure plant polypeptide comprising the amino acid sequence:

Gly Xaa_1 Xaa_2 Gly Xaa_3 Gly Lys Thr Thr Xaa_4 Xaa_5, wherein Xaa_1 is Met or Pro; Xaa_2 is Gly or Pro; Xaa_3 is Ile, Leu, or Val; Xaa_4 is Ile, Leu, or Thr; and Xaa_5 is Ala or Met.

55. A substantially pure plant polypeptide comprising the amino acid sequence:

Xaa_1 Xaa_2 Xaa_3 Leu Xaa_4 Xaa_5 Xaa_6 Asp Asp Xaa_7 Xaa_8, wherein Xaa_1 is Phe or Lys; Xaa_2 is Arg or Lys; Xaa_3 is Ile, Val, or Phe; Xaa_4 is Ile, Leu, or Val; Xaa_5 is Ile or Leu; Xaa_6 is Ile or Val; Xaa_7 is Ile, Leu, or Val; and Xaa_8 is Asp or Trp.

56. A substantially pure plant polypeptide comprising the amino acid sequence:

Xaa_1 Xaa_2 Xaa_3 Xaa_4 Xaa_5 Thr Xaa_6 Arg, wherein Xaa_1 is Ser or Cys; Xaa_2 is Arg or Lys; Xaa_3 is Phe, Ile, or Val; Xaa_4 is Ile, or Met; Xaa_5 is Ile, Leu, or Phe; Xaa_6 is Ser, Cys, or Thr.

57. A substantially pure plant polypeptide comprising the amino acid sequence:

Gly Leu Pro Leu Xaa_1 Xaa_2 Xaa_3 Xaa_4,

wherein Xaa_1 is Thr, Ala, or Ser; Xaa_2 is Leu or Val; Xaa_3 is Ile, Val, or Lys; and Xaa_4 is Val or Thr.

58. A substantially pure plant polypeptide comprising the amino acid sequence:

Xaa_1 Xaa_2 Ser Tyr Xaa_3 Xaa_4 Leu,

wherein Xaa_1 is Lys or Gly; Xaa_2 is Ile or Phe; Xaa_3 is Asp or Lys; and Xaa_4 is Ala, Gly, or Asn.

59. A method of isolating a disease-resistance gene or fragment thereof from a plant cell, comprising:

(a) providing a sample of plant cell DNA;

(b) providing a pair of oligonucleotides having sequence homology to a conserved region of an RPS disease-resistance gene;

(c) combining said pair of oligonucleotides with said plant cell DNA sample under conditions suitable for polymerase chain reaction-mediated DNA amplification; and

(d) isolating said amplified disease-resistance gene or fragment thereof.

60. The method of claim 59, wherein said amplification is carried out using a reverse-transcription polymerase chain reaction.

61. The method of claim 59, wherein said reverse-transcription polymerase chain reaction is RACE.

62. A method of identifying a plant disease-resistance gene in a plant cell, comprising:

(a) providing a preparation of plant cell DNA;

(b) providing a detectably-labelled DNA sequence having homology to a conserved region of an RPS gene;

(c) contacting said preparation of plant cell DNA with said detectablly-labelled DNA sequence under hybridization conditions providing detection of genes having 50% or greater sequence identity; and

(d) identifying a disease-resistance gene by its association with said detectable label.

63. The method of claim 62, wherein said DNA sequence is produced according to the method of claim 59.

64. The method of claim 62, wherein said preparation of plant cell DNA is isolated from a plant genome.

65. A method of isolating a disease-resistance gene from a recombinant plant cell library, comprising:

(a) providing a recombinant plant cell library;

(b) contacting said recombinant plant cell library with a detectably-labelled gene fragment produced according to the method of claim 59 under hybridization conditions providing detection of genes having 50% or greater sequence identity; and

(c) isolating a member of a disease-resistance gene by its association with said detectable label.

66. A method of isolating a disease-resistance gene from a recombinant plant cell library, comprising:

(a) providing a recombinant plant cell library;

(b) contacting said recombinant plant cell library with a detectably-labelled oligonucleotide of any of claims 41-49 under hybridization conditions providing detection of genes having 50% or greater sequence identity; and

(c) isolating a disease-resistance gene by its association with said detectable label.

67. A recombinant plant polypeptide capable of conferring disease-resistance wherein said plant polypeptide comprises a P-loop domain or nucleotide binding site domain.

68. The recombinant plant polypeptide of claim 67, wherein said polypeptide further comprises a leucine-rich repeating domain.

69. A recombinant plant polypeptide capable of conferring disease-resistance wherein said plant polypeptide contains a leucine-rich repeating domain.

70. A plant disease-resistance gene isolated according to the method comprising:

(a) providing a sample of plant cell DNA;

(b) providing a pair of oligonucleotides having sequence homology to a conserved region of an RPS disease-resistance gene;

(c) combining said pair of oligonucleotides with said plant cell DNA sample under conditions suitable for polymerase chain reaction-mediated DNA amplification; and

(d) isolating said amplified disease-resistance gene or fragment thereof.

71. A plant disease-resistance gene isolated according to the method comprising:

(a) providing a preparation of plant cell DNA;

(b) providing a detectably-labelled DNA sequence having homology to a conserved region of an RPS gene;

(c) contacting said preparation of plant cell DNA with said detectably-labelled DNA sequence under hybridization conditions providing detection of genes having 50% or greater sequence identity; and

(d) identifying a disease-resistance gene by its association with said detectable label.

72. A plant disease-resistance gene according to the method comprising:

(a) providing a recombinant plant cell library;

(b) contacting said recombinant plant cell library with a detectably-labelled gene fragment produced according to the method of claims 41-49 under hybridization conditions providing detection of genes having 50% or greater sequence identity; and

(c) isolating a disease-resistance gene by its association with said detectable label.

73. A method of identifying a plant disease-resistance gene comprising:

(a) providing a plant tissue sample;

(b) introducing by biolistic transformation into said plant tissue sample a candidate plant disease-resistance gene;

(c) expressing said candidate plant disease-resistance gene within said plant tissue sample; and

(d) determining whether said plant tissue sample exhibits a disease-resistance response, whereby a response identifies a plant disease-resistance gene.

74. The method of claim 73, wherein said plant tissue sample comprises leaf, root, flower, fruit, or stem tissue.

75. The method of claim 73, wherein said candidate plant disease-resistance gene is obtained from a cDNA expression library.

76. The method of claim 73, wherein said disease-resistance response is the hypersensitive response.

77. A plant disease-resistance gene isolated according to the method comprising:

(a) providing a plant tissue sample;

(b) introducing by biolistic transformation into said plant tissue sample a candidate plant disease-resistance gene;

(c) expressing said candidate plant disease-resistance gene within said plant tissue sample; and

(d) determining whether said plant tissue sample exhibits a disease-resistance response, whereby a response identifies a plant disease-resistance gene.

78. A purified antibody which binds specifically to an rps family protein.

79. A DNA sequence substantially identical to the DNA sequence shown in Figure 12.

80. A substantially pure polypeptide having a sequence substantially identical to a Prf amino acid sequence shown in Figure 5 (A or B).